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# The association between socio-demographic characteristics and perceived stress among residents in a deprived neighbourhood in Denmark

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**Background:** It is known that stress is associated with various negative health outcomes, and higher levels are found among people with low socio-economic status (SES) compared with those better-off. Evidence of the characteristics of deprived neighbourhoods with negative impact on health and stress is accumulating while little is known about the stress variation by the socio-demographic characteristics of the dwellers. The present study aimed to investigate how stress varies by socio-demographic characteristics of the residents in a deprived neighbourhood. **Methods:** The data used in this article were collected in the spring 2009. The 1160 participants, aged 16–104 years were randomly selected among the residents in a deprived neighbourhood in Esbjerg, Denmark. The survey was conducted through telephone and face to face interviews. Multiple linear regression analyses were carried on to examine the association of perceived stress with age, gender, ethnicity, education, civil status, economy, unemployment, sick leave, social deprivation and loneliness. **Results:** The results show higher levels of stress among women, immigrants, poor and lonely compared with their counterparts. Stress decreases as the economy situation improves and people get old. Education, civil status and unemployment, initially significant, lost power in association with stress when income and economic deprivation were taken into account. **Conclusion:** The results of this study suggest that variation in the stress levels across socio-demographic characteristics may have specific features among people in the low SES hierarchy, dwellers of a deprived neighbourhood.

## Introduction

The present study aimed to investigate how stress varies by socio-demographic characteristics among residents in a deprived neighbourhood. In a transactional approach, stress is a cognitive appraisal process during which a situation is perceived as threatening or demanding and the resources to cope are perceived as insufficient.<sup>1,2</sup> Stress has been approached from various perspectives and each perspective has contributed with pieces of knowledge trying to solve the puzzle of explanatory mechanisms in the interplay between persons, context and health. Psychological studies on clinical and non-clinical populations have focused on stress and coping processes and their relations with physical and mental health.<sup>3–5</sup> In social epidemiology, stress has been addressed as the link between socio-economic hierarchy and the health gradient.<sup>6–8</sup> Sociological studies have emphasized the role of socio-demographic factors in the experience of stress. Accordingly, people's location in the social structure has consequences for the exposure to stress and the kind of stressors, the perception of resources to master daily life, and the health outcomes.<sup>9,10</sup> Characteristics such as social and economic class, ethnicity, gender, age, marital and occupational status may act as structural constraints that limit the individual's opportunities, choices or alternatives.<sup>9–11,12</sup>

Empirical evidence has shown both higher exposure to stress and lower perception of coping resources among women, unmarried, less educated, ethnic minorities or persons in socially disadvantaged situation compared with men, married, highly educated and wealthier individuals.<sup>9–11,13,14</sup> Multiple pathways may lead to differences in the levels of stress between population sub-groups. Thus, very often problematic situations go on concurrently in people's daily life, and their perceived stress may have independent or cumulative effects on health.<sup>2,11,14</sup> Also, the stressors may unfold in a chain of causation, some social conditions leading inevitably to others. Unemployment, for example, results in

diminishing or loss of income and further economic strain.<sup>13,15</sup> Although social conditions may define people's stress experiences, they can also be sources of stress when they equate resources, deprivation, economic strain or the frustration of unreach goals.<sup>16</sup>

Independently from individual characteristics, places where people live exert a substantial influence on health.<sup>9,14,17–20</sup> Neighbourhood effects operate through the availability and accessibility of health services, infrastructure, attitudes towards health and behaviours, and social support. Stress levels have been found higher in deprived neighbourhoods compared to wealthier residential areas.<sup>18,19,21,22</sup> Low, in comparison with high socio-economic neighbourhoods appeared to increase exposure to stress and to sustain chronic stress due to limited services and poor infrastructure, and a lack of social support.<sup>10,21,23</sup> While evidence about deprived neighbourhood characteristics that are relevant to health and stress is accumulating, less is known about the stress variation by the socio-demographic characteristics among the residents.

Evidence about stress determinants and its distribution in non-clinical samples in Denmark is limited.<sup>24</sup> The lack of information about stress experienced by unemployed and socially disadvantaged persons should in particular be a concern due to their increased risk of poor health, health care costs and human suffering compared with the general population.<sup>24–26</sup> Even Denmark is a welfare state, 29 communities meet the criteria of deprived neighbourhoods ('ghetto'). People living there may have even higher levels of stress, exacerbated by environmental factors compared to people with similar social status dwelling in better-off neighbourhoods.

The current study addressed the need of evidence about variation of stress by socio-demographic characteristics among the residents in deprived neighbourhoods. 'Deprived neighbourhood' was defined here as a small geographical area with a high concentration of people with a low SES characterized by indicators such as unemployment, low income, low education and low paid jobs.<sup>27</sup> In the surveyed neighbourhood,

besides unemployed, people receiving social assistance and early retired persons, there is a high concentration of immigrants. Stress defined as a transaction between person and environment was measured as a general reaction to difficulties in daily life.<sup>1,2,28</sup> The hypothesis was that immigrants, women, low educated, unmarried, lonely, middle-aged and persons with low SES perceive higher levels of stress than their counterparts.

## Methods

### Study population

Data were provided by the Esbjerg municipality, and were collected in 2009 through a survey in a socially deprived neighbourhood of Esbjerg, 'Kvaglund', which is on the government's ghetto list.<sup>29</sup> The classification as 'ghetto' follows at least two out of three criteria: the proportion of non-Western immigrants exceeds 50%, the proportion of 18- to 64-year-old adults outside the labour market (unemployed, disabled/in sick leave, early retired, people receiving social assistance) exceeds 40%, and the number of convicted exceeds 270 persons in the community. Within Kvaglund there are areas where the concentration of immigrants is ~63% of the population and 47% of the residents have no labour market attachment.<sup>30</sup> For the current study, 2246 individuals were randomly selected from the 14601 residents. Of them, 469 could not be reached, and 617 refused to participate in the study, resulting in a response rate of 51.8%. The survey was conducted through telephone and face to face interviews (1004 and 156 respondents, respectively).

Among the respondents, 624 were women and 536 men aged between 16 and 104 years, and 851 were ethnic Danes and 308 had other origin such as Eastern Europe, Middle East, Vietnam, Turkey and Nordic countries. Prior to data collection, a pilot study was conducted in a convenience sample of immigrants from Kvaglund to test the questionnaire's comprehension. The pre-test results showed that no change is necessary in the questionnaire wording.

### Measurements

Data analysed in the present study were drawn from a broader survey, which included the following measurements: 'Stress' in daily life was the outcome variable and was measured by the perceived stress scale (PSS) ( $M = 25.0$ ;  $SD = 8.00$ ; Cronbach's  $\alpha$  coefficient of reliability = 0.86 on a community sample).<sup>28</sup> For the purpose of the present study, the 10-item version of the scale was preferred.<sup>31</sup> The items (Appendix 1) were prefaced by the following instructions: 'The questions below are about irritating or stressful situations you experienced in the last month'. The response options ranged between 0 (never) and 4 (very often). High scores indicated a high level of stress on 6 items and 4 items were reverse scored.

The independent variables were as follows.

### Gender

Women were coded 2 and men were coded 1.

### Age

The respondents were asked to report their birth date, which was transformed in age years. Age was treated as continuous variable.

### Ethnicity

The study participants were asked to say what their ethnical background is. The sampled participants represented 40 countries from the Middle East, Africa, East Europe and Asia and Western countries from Europe and North America. Ethnicity was classified as Danes (coded 1) and immigrants (coded 2).

### Education

The participants education was assessed by the question 'Which is the last school you graduated?' The response options included 1: long duration of

higher education ( $\geq 5$ ); 2: medium duration of higher education (3–4 years); 3: short duration of higher education (1–2 years); 4: commercial upper secondary school (high school); 5: technical school/one year apprenticeship post secondary school; 6: apprenticeship (e.g. craftsmen); 7: other apprenticeship, such as language courses or labour market courses for unskilled workers; 8: primary school, secondary school; 9: no education. 'I do not want to answer' was the final response option. In the analyses, education was treated as continuous variable.

### Marital status

The respondents were asked to report whether they were married, cohabitating, single, widowed, divorced or separated. The response alternatives were dichotomized into married or cohabitating (coded 1) and single, widowed, separated or no longer cohabitating (coded 2).

### Unemployment

A single item was used to measure the duration of unemployment over the 3 years before the survey. The response alternatives were as follows: no, <3 months, 3 months to a year, 1–2 years and >2 years, coded from 0 to 4. The answers were dichotomized into 'always employed' (coded 1) and 'unemployed' (coded 2).

### Sick leave

A single item measured the occurrence and the duration of sick leave. The response options were as follows; no, <3 months, 3–6 months, 6 months to 1 year, >1 year. The response options were dichotomized into 'sick leave' (coded 2) and 'no leave' (coded 1).

### Economic situation

The monthly financial resources were measured by the amount of money remaining after all daily living expenses were taken into account. The response options ranged from '0 to 999' (coded 1) to 'more than 10 000' (coded 2) kroner. Economic situation was treated as continuous variable.

### Economic deprivation

A deprivation index was computed based on seven items: 'paying bills', 'paying for unexpected things', 'paying for leisure activities', 'buying gifts', 'go to the dentist', 'buy necessary medication' and 'buy clothes', prefaced by the question: 'Was you or your family unable to do one or more of the following things because of economic reasons?'. The response options were 'yes' and 'no'. The deprivation index was computed summing up the positive answers which were coded 2: 'deprivation' while the negative answers were coded 1: 'no deprivation'.

### Missing data

Missing data were <5% for all variables but 'Economic situation'. According to Tabachnick<sup>32</sup> no imputation is needed to missing data at this level. A low response rate to questions about personal finance is quite common in surveys and considered a sensitive topic.

### Statistical analysis

Data were analysed using PASW Statistics 18 version. Preliminary analyses included descriptive statistics, reliability and correlations. Hierarchical multiple regression analyses were used to examine the association of socio-demographic characteristics with stress levels as outcome.

## Results

Descriptive statistics are shown in table 1. The reliability coefficient Cronbach's  $\alpha$  was 0.82 showing good internal consistency of the PSS. The age range extended towards late years, while 'unemployment' and 'sick leave' applied only to work-age participants. Therefore, two

correlation matrices—one for all ages and one for work-age—were produced for interpretation purposes, and are shown in table 2. Table 3 presents the results from hierarchical multiple regression analyses. The socio-demographic characteristics have been entered into the equation one at a time. One regression analysis was conducted with data from all ages participants on suitable variables, and a second analysis used data from work-age participants and included ‘unemployment’ and ‘sick leave’ variables. The analysed models explained ~19 and 24%, respectively, in the variance of perceived stress. As the beta coefficients showed, ‘civil status’ and ‘education’ association with the PSS dropped to a non-significant size when ‘economy’ has been entered into the equation, and so did the association of ‘unemployment’ with the PSS when ‘deprivation index’ was added to the models. The positive associations showed that stress levels increased in women, immigrants, those who had had sick leave, economically deprived individuals, and lonely people in comparison with their counterparts. The negative associations of PSS with ‘age’ and ‘economy’ suggested that stress decreases as the ‘economy’ improve and people get older. ‘Deprivation index’, ‘sick leave’ and ‘age’ had the strongest relationships with the PSS.

## Discussion

The number of published studies on the health impact of neighbourhood suggests a growing interest for this kind of effects, and arguments to

provide more evidence of the interplay between personal and environmental characteristics in the health process.<sup>21</sup> The aim of this article was to investigate how stress levels among the residents in a deprived neighbourhood vary by socio-demographic characteristics. Overall, the results show that age, gender, ethnicity, economic situation, social deprivation and loneliness make a difference in how people perceive stress in daily life, as it was anticipated. However, the hypothesis was only partially confirmed. Education, civil status, and unemployment initially related to stress, dropped off the power of association to the non-significant levels when economy and social deprivation were taken into account.

Higher levels of stress among women, immigrants, poor and lonely compared with their counterparts are commonly found in community based studies worldwide.<sup>11,16</sup> The evidence of relationships between stress and SES in Denmark is mixed, showing negative and positive associations.<sup>25,26,31</sup>

Explanations for the higher levels of stress among women compared to men and among immigrants compared with the host population include a larger number of stressors and higher reactivity due to differences in coping.<sup>10,11</sup> The role of SES indicators in differentiating the stress levels has consistently been documented in the literature.<sup>9–11,13,14</sup> In the same line, the current findings show a chain of effects in which economy, unemployment, and economic deprivation play mediating roles in the relationship between education and stress. Further, it appears that economy mediates also the effect of marital status on stress, and

**Table 1** Descriptive statistics: mean, standard deviation, median and frequency

Variables	N/%	Mean (SD)	Median	PSS Mean (SD)
Perceived stress (all)	1157	10.72 (17.74)		
Loneliness	1158	1.63 (1.02)		
Age (all)	1157	51.63 (17.74)		
≤70	970/83.8			11.15 (6.56)
≥70	187/16.2			8.39 (5.61)
Education	1150		High school	
Economy	865		5000–5999	
Gender	1160			
Men	536/6.2			9.80
Women	624/53.8			11.55 (6.65)
Ethnicity	1159			
Ethnic Danes	851/73.4			9.91 (6.04)
Immigrants	308/26.6			13.65 (7.31)
Civil status	1160			
Married	735/63.4			10.14 (6.03)
Single	424/36.6			11.72 (7.19)
Unemployment (age ≤70)	970			
Employed	694/75.5			10.29 (6.17)
Unemployed	235/24.5			13.56 (6.76)
Sick leave (age ≤70)	970			
No sick leave	683/73.7			10.22 (6.05)
Sick leave	244/26.3			13.51 (7.14)
Deprivation index	1160			
No, low deprived	1064/91.7			10.24 (6.13)
Deprived	96/8.3			16.84 (7.99)

**Table 2** Correlation matrices (the upper right correlation matrix is for all ages sample; the down left matrix is for the work-age sub-sample)

Variables	Perceived stress	Age	Gender	Ethnicity	Education	Civil status	Economy	Unemployment	Sick leave	Deprivation	Loneliness
Perceived stress		−0.236**	0.134**	0.237**	0.040	0.008	−0.234**	0.234**	0.232**	0.265**	0.197**
Age	−0.197**		−0.013	−0.242**	−0.054	−0.048	−0.075*	−0.270**	−0.205**	−0.114**	−0.141**
Gender	0.147**	−0.031		0.063*	0.025	0.032	0.064	0.014	0.014	0.009	0.046
Ethnicity	0.228**	−0.218**	0.067**		.069*	0.048	−0.275**	0.214**	0.062*	0.174**	0.118**
Education	0.045	0.065*	0.032	−0.070*		−0.047	0.335**	−0.143**	0.012	−0.002	0.014
Civil status	0.006	−0.054	−0.036	0.049	0.051		−0.052	0.065*	0.014	0.099**	−0.014
Economy	−0.277**	0.070	−0.051	−0.311**	.338**	−0.057		−0.230**	0.067	−0.311**	−0.130**
Unemployment	0.213**	−0.209**	0.011	0.191**	.158**	0.085*	−0.272**		0.267**	−0.250**	0.124**
Sick leave	0.221**	−0.120**	0.033	0.035**	−0.014	0.004	−0.104**	0.240**		0.216**	0.065*
Deprivation index	0.268**	−0.097**	0.011	0.156**	0.000	0.104	0.327**	0.226**	0.191**		0.090**
Loneliness	0.197**	−0.120**	0.018	0.102**	−0.017	−0.017	−0.160**	0.112**	0.044	0.086**	

\* $P < 0.05$ ; \*\* $P < 0.001$ .

**Table 3** Hierarchical multiple regression analyses with perceived stress as dependent variable: standardized coefficients beta and fit statistics

Variables	Analyses with data from all ages sample								Analyses with data from work-age sub-sample			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 1	Model 2	Model 3	Model 4
Age	-0.239*	-0.235*	-0.195*	-0.205*	-0.206*	-0.224*	-0.199*	-0.181*	-0.126*	-0.101*	-0.097*	-0.078*
Gender		0.116*	0.111*	0.109*	0.108*	0.099*	0.100*	0.099*	0.108*	0.098*	0.095*	0.098*
Ethnicity			0.177*	0.155*	0.156*	0.123*	0.108*	0.102*	0.130*	0.143*	0.123*	0.122*
Education				-0.099*	-0.101*	-0.051	-	-	-	-	-	-
Civil status					0.119*	0.025	-	-	-	-	-	-
Economy						-0.197*	-0.153*	-0.140*	-0.208*	-0.200*	-0.145*	-0.129*
Unemployment							-	-	0.109*	0.076*	0.056	0.053
Sick leave							-	-		190*	0.164*	0.168*
Deprivation index							0.200*	0.194*			0.217*	0.211*
Loneliness								0.129*				0.142*
Adjusted R <sup>2</sup>	0.056	0.068	0.097	0.105	0.104	0.138	0.172	0.187	0.143	0.176	0.216	0.235
R <sup>2</sup> change	0.057	0.013	0.030	0.009	0.000	0.034	0.035	0.016	0.011	0.034	0.041	0.019
	F(1-805)	F(1-804)	F(1-803)	F(1-802)	F(1-801)	F(1-800)	F(1-801)	F(1-800)	F(1-679)	F(1-678)	F(1-677)	F(1-676)
	= 8.61*	= 11.64*	= 6.62*	= 8.46*	= 0.31*	= 2.08*	= 4.41*	= 5.71*	= 8.38*	= 28.23*	= 35.46*	= 17.29*

\**P* < 0.005, \*\**P* < 0.001.

income may explain the higher levels of stress among single persons. The serial connection of SES indicators has already been suggested by evidence of partial mediation.<sup>10</sup> In the current study, the dynamic association of marital status, education and unemployment with stress that dropped to non-significant levels might suggest particular features of people in a deprived situation (defined by personal and environmental characteristics such as the low stratum of socio-economic ladder and poor neighbourhood). The residents in a deprived neighbourhood tend to be medium to low educated, have low paid jobs and it is very likely that share these characteristics with their spouses. In the general population, where the average economic situation is ranked higher, civil status, education, and unemployment are simultaneously associated with income, but the finance is not worrisome in regard to daily living needs and related stress may result from the threats to fulfil other goals than survival. Additional evidence shows that unemployment is more frequent among people with low education and low paid jobs compared to people with higher SES and therefore, the effect of social deprivation on stress may be stronger in this population group.<sup>33</sup> Social support that may protect against stress has been proved to be lower in deprived neighbourhoods and therefore, the poor, besides finance are deprived of an important coping resource.<sup>11</sup> The significant positive association of loneliness with stress in this study supports this conclusion.

The inverse relationship of stress with age contradicts findings from the general population, where the levels of stress reach a pick at midlife and late age<sup>15,34</sup> and suggests the struggle of the young generation with the hardship of daily life in the context of economic deterioration. Several studies have documented the lifespan social disadvantage of children born and raised in deprived neighbourhoods—including family.<sup>10,11</sup>

Besides direct effects, stress may associate with health problems indirectly, through behaviours such as sedentary lifestyle, poor diet, alcohol abuse and smoking that can be engaged purposely to cope with difficulties in daily life.<sup>35</sup> Therefore, the experience of stress may have more adverse consequences for health due to simultaneous pathways of impairment. It has been suggested that such behaviours are the result of poor education and may be enhanced in a deprived neighbourhood by the social tolerance and favourable attitudes towards these kinds of practices.<sup>35</sup> Although health-related behaviours were not included in the present analyses, the respondents who reported sick leave showed increasing levels of stress compared with their counterparts.

Data for the present study were drawn from a population in the lowest segment of the socio-economic gradient. The results confirm that in any segment of the gradient the most advantaged persons have better health status (low levels of stress in this case) than the less advantaged.<sup>7</sup> However, in spite of the socio-economic disadvantages some people perceive low or not at all stress in their daily life. It has been documented that poor individuals have less resources to cope with difficult situations than those better-off. They perceive less control over their own life and are less socially integrated, lacking social support.<sup>36-38</sup> Nonetheless, according to the current results some people in a deprived neighbourhood do cope with stress and therefore it has to be found to what extent personal and environmental characteristics contribute to the development of resilience.

Another inquiry should be directed into the interaction of socio-economic and socio-demographic factors to see how it shapes different health profiles. As group characteristics do not apply uniformly to each member, health promotion interventions should be tailored to the population's diversity and based on extended health profiles that include psycho-social, socio-demographic and environmental variables, which together unravel the complex mechanisms of risk.

### Limitations

Data were cross-sectional and did not allow for causal inference. The current study did not aim to make comparisons between the deprived neighbourhood's dwellers and the general population or the residents in more advantaged areas. However, these comparisons should be considered in further research. Another limitation is associated with the two data collection methods—telephone and face to face interviews—that might have induced bias in responses.



## Conclusion

The present results show that stress among people in the low SES, in a deprived neighbourhood, is associated with gender, economy, sick leave, social deprivation and loneliness in a similar manner to the general population. The lack of a significant contribution of education, civil status and unemployment seems to be a feature of low SES population living in a deprived neighbourhood. Another feature of these circumstances appears to be the inverse association of stress with age. Further research should address the role of socio-demographic characteristics in relation with stress in analytical models that include coping factors and health outcomes to examine the mechanisms of risk. Also, knowledge would advance with evidence of stress variation in population sub-groups comparisons.

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*Conflicts of interest:* None declared.

### Key points

- The lack of a significant contribution of education, civil status and unemployment seems to be a feature of low SES population living in deprived neighbourhoods.
- The results from this study can be helpful in developing and conducting local health prevention strategies that target disadvantaged people residing in deprived neighbourhoods anywhere in Europe.
- Further research should include measurements that highlight mechanisms of risk (perceived control, social support, health-related behaviours and social status) and allow structural models analyses among these disadvantaged groups.

## Appendix 1

### Perceived stress scale (Cohen, 1983)

In the last month, how often have you been upset because of something that happened unexpectedly?  
 In the last month, how often have you felt that you were unable to control the important things in your life?  
 In the last month, how often have you felt nervous and 'stressed'?  
 In the last month, how often have you felt confident about your ability to handle your personal problems?  
 In the last month, how often have you felt that things were going your way?  
 In the last month, how often have you found that you could not cope with all the things that you had to do?  
 In the last month, how often have you been able to control irritations in your life?  
 In the last month, how often have you felt that you were on top of things?  
 In the last month, how often have you been angered because of things that were outside of your control?  
 In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

## References

- 1 Lazarus RS. *Psychological stress and the coping process*. New York: McGraw-Hill, 1966.

- 2 Lazarus RS, Folkman S. *Stress, appraisal and coping*. New York: Springer, 1984.
- 3 Cohen S, Janicki-Deverts D, Miller GE. Psychological stress and disease. *J Am Med Assoc* 2007;298:1685–7.
- 4 Kiecolt-Glaser JK, McGuire L, Robles TF, Glaser R. Psychoneuroimmunology and psychosomatic medicine: back to the future. *Psychosom Med* 2002;64:15–28.
- 5 Folkman S, Lazarus RS, Gruen RJ, DeLongis A. Appraisal, coping, health status, and psychological symptoms. *J Pers Soc Psychol* 1986;50:571–9.
- 6 Wilkinson R. The epidemiological transition: from material scarcity to social disadvantage? *Health and Wealth* 1994;133:61–77.
- 7 Stansfeld S, Patel C, North F, et al. Health inequalities among British civil servants: the Whitehall II study. *Lancet* 1991;337:1387–93.
- 8 Marmot MG. Understanding social inequalities in health. *Perspect Biol Med* 2003;46:9–23.
- 9 Pearlin LI. The sociological study of stress. *J Health Soc Behav* 1989;30:241–56.
- 10 Aneshensel CS. Towards explaining mental health disparities. *J Health Soc Behav* 2009;50:377.
- 11 Thoits PA. Stress and health: major findings and policy implications. *J Health Soc Behav* 2010;51:41–53.
- 12 Wheaton B. Social stress, Chapter 14. In: Aneshensel and phelan editors. *Handbook of sociology of mental health*. New York: Kluwer Academic/Plenum, 1999: 277–300.
- 13 Turner RJ, Wheaton B, Lloyd DA. The epidemiology of social stress. *Am Sociol Rev* 1995;60:104–25.
- 14 Pearlin LI. The stress process revisited. Reflections on concepts and their interrelationships. In: Aneshensel CS, Jo CP, editors. *Handbook of the sociology of mental health*. New York: Academic/Plenum Publishers, 1999.
- 15 Pearlin LI, Schieman S, Fazio EM, Meersman SC. Stress, health and the life course: some conceptual perspectives. *J Health Soc Behav* 2005;46:205–19.
- 16 Aneshensel CS. Social stress: theory and research. *Annu Rev Sociol* 1992;18:15–38.
- 17 Kaplan GA. People and places: contrasting perspectives on the association between social class and health. *Int J Health Serv* 1996;26:507–19.
- 18 Steptoe A, Feldman PJ. Neighborhood problems as sources of chronic stress: development of a measure of neighborhood problems, and associations with socioeconomic status and health. *Annu Behav Med* 2001;23:177–85.
- 19 Matheson FL, Moineddin R, Dunne JR, et al. *Soc Sci Med* 2006;63:2604–16.
- 20 Macintyre S, Ellaway A, Cummins S. Place effects on health: how can we conceptualize, operationalize and measure them? *Soc Sci Med* 2002;55:125–39.
- 21 Pickett KE, Pearl M. Multilevel analyses of neighbourhood socioeconomic context and health outcomes: a critical review. *J Epidemiol Commun Health* 2001;55:111–22.
- 22 Mair C, Diez- Roux AV, Galea S. Are neighbourhood characteristics associated with depressive symptoms? A review of evidence. *J Epidemiol Commun Health* 2008;62:940–6.
- 23 Ross CE, Mirowsky J. Neighborhood disadvantage, disorder and health. *J Health Soc Behav* 2001;42:258–76.
- 24 Thoits PA. Stress, coping and social support processes: where are we now? What next? *J Health Soc Behav* 1995;35:53–79.
- 25 Nielsen L, Curtis T, Kristensen TS, Nielsen NR. What characterizes persons with high levels of perceived stress in Denmark? A national representative study. *Scand J Public Health* 2008;36:369–79.
- 26 Nielsen NR, Kjeller M, Kamper-Jørgensen F, Grønbaek MN. Stress blandt erhvervsaktive danskere (Stress among working Danes). *Ugeskrift for Læger* 2004;166:4155–60.
- 27 Hansen RS. Sundhedsprofil for den østlige bydel af Esbjerg. [Health profile in the eastern part of Esbjerg 2009]. *Sundhuset Esbjerg* 2010.
- 28 Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav* 1983;24:385–96.
- 29 Socialministeriet. Aftale mellem regeringen (Venstre og Konservative Folkeparti), Dansk Folkeparti og Radikale Venstre om styrket indsats i ghettoområderne og anvendelsen af den almene boligsektors midler. Available at: [www.sm.dk/data/Dokumentertilnyheder/2010/BA10.pdf](http://www.sm.dk/data/Dokumentertilnyheder/2010/BA10.pdf) [Agreement between the Government (Venstre and Konservative), Dansk Folkeparti and Radikale Venstre about improved efforts in ghetto areas and the use of the social housing sector funding]. *Socialministeriet* 2010.
- 30 Programbestyrelsen for dialog og balance i udsatte boligområder. *Fra udsat boligområde til hel bydel*. 2008. København. Available at: [www.nyidanmark.dk/programbestyrelsen](http://www.nyidanmark.dk/programbestyrelsen) (28 February 2011, date last accessed). [Program Board for dialogue and balance in vulnerable neighborhoods. From residential area exposed to a whole district. Copenhagen].
- 31 Olsen LR, Mortensen EL, Bech P. Prevalence of major depression and stress indicators in the Danish general population. *Acta Psychiatr Scand* 2004;109:96–103.
- 32 Tabachnick BG, Fidell LS. *Using multivariate statistics*. London: Allyn and Bacon, 2001.

- 33 Blane D. The life course, the social gradient, and health, Chapter 4. In: Marmot MG, Wilkinson RG, editors. *Social determinants of health*. Oxford, UK: Oxford University Press, 2006.
- 34 Almeida DM, Horn M. Is daily life more stressful during middle adulthood? In: Brim OG, Ryff CD, Kessler RC, editors. *How healthy are we? A national study of well-being at midlife*. Chicago: The University Press, 2004: 425–51.
- 35 Stroebe W. *Stress and health. Social psychology and health*. UK: Open University Press, 2000: 207–36.
- 36 Andersen PT, Bak CK, Vangsgaard S, et al. Self rated health, ethnicity and social position in a deprived neighbourhood in Denmark. *Int J Equity Health* 2011;10:5.
- 37 Bak CK. Demokratisering af fattigdommen? En kritisk analyse af indkomstbaserede fattigdomsundersøgelser. [Democratization of poverty? A critical analysis of income based poverty studies]. *Dansk Sociologi* 2004;15:57–75.
- 38 Larsen EL, Andersen PT, Bak CK. Arbejdsmarkedseksklusion og social udsatte borgere. [Exclusion from the labour market and social vulnerable citizens]. *Tidsskrift for Sygdom og Samfund*; In press.

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## Pandemic influenza A (H1N1) 2009 in Madrid, Spain: incidence and characteristics in immigrant and native population

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**Background:** Some immigrants and refugees might be more vulnerable than other groups to pandemic influenza because of pre-existing health and social disparities, migration history and living conditions. The objective of this study was to compare, between the immigrant and autochthonous population, the incidence and characteristics of influenza cases consulting in primary care (PC) and severe influenza cases. **Methods:** Descriptive cross-sectional study of influenza episodes registered in PC and severe influenza cases reported between 1 May 2009 and 22 May 2010, by gender and origin. Age-adjusted rates were calculated and the association between origin and chronic pathology, pregnancy, delay in admission to hospital and admission to intensive care units (ICU) was analyzed by logistic regression and generalized linear models. **Results:** The influenza rate in PC, adjusted by age, was lower for immigrant population (2396.3, 95% confidence interval (95% CI) 2362.5–2430.0 vs. 2795.9, 95% CI 2780.4–2811.5 per 100 000). The difference between severe influenza rates by origin was not statistically significant. Chronic conditions were less common in immigrant population. In severe influenza cases, pregnancy was more common in immigrant women, and the probability of admission to ICU was higher in men from Central and Eastern Europe (prevalence ratio (PR) 8.44, 95% CI 2.81–25.40) and North African women (PR 3.30, 95% CI 1.09–10.05). **Conclusion:** Differences in influenza rates were detected by origin. This information could be useful for new pandemic wave management purposes, in addition to targeting future investigations. Pandemic influenza preparedness and response plans should incorporate specific actions to improve immigrants' access to health services and to decrease cultural barriers.

## Introduction

Pandemic influenza A (H1N1) emerged in April of 2009 and rapidly spread throughout the world. This new virus posed several uncertainties, and among them was the identification of the main risk groups. Some major risk factors for severe disease and death have been described. There was a higher mortality among young people.<sup>1</sup> The role of pregnancy, asthma, chronic obstructive pulmonary disease and metabolic conditions (diabetes mellitus, obesity) in the occurrence of severe pandemic H1N1 influenza infection has been documented too.<sup>2,3</sup>

Some immigrants and refugees might be more vulnerable than other groups to pandemic influenza because of pre-existing health and social disparities, migration history and living conditions.<sup>4</sup> The existence of barriers to health care, such as cultural obstacles, differences in language, lack of knowledge of the health care system, seem to be related with worse health outcomes.<sup>5</sup>

European countries rarely collect health data by ethnicity (the UK, Sweden and the Netherlands being exceptions).<sup>5</sup> An observational population-based study in UK found higher pediatric mortality rates related to pandemic influenza A (H1N1) in some ethnic minority

groups (Bangladeshi and Pakistani children).<sup>6</sup> During the first wave of pandemic influenza A (H1N1) in Norway, an analysis of the hospitalized patients with influenza-like illness found a higher proportion of non-ethnic Norwegians among the H1N1 positive patients.<sup>7</sup>

Non-Hispanic blacks, Hispanics and Asians had higher hospitalization rates due to pandemic influenza A (H1N1) 2009 in the USA,<sup>8,9</sup> and mortality rates were four times higher in American natives.<sup>10</sup> Indigenous populations from Australia, Canada and New Zealand have been found to have a three to eight times higher rate of hospitalization and death associated with infection with the 2009 pandemic influenza A (H1N1) virus.<sup>10,11</sup> The occurrence of more severe forms of the infection could be explained by the following hypotheses: much higher prevalence of identified risk factors for severe disease and death, differences in approaches to health, difficulties in accessing or delayed access to health care, living conditions (poverty, overcrowding) and increased genetic susceptibility.<sup>10,11</sup>

In Spain there is no published information on this subject. The objective of this study was to compare, between the immigrant and autochthonous populations in the Madrid region, the incidence and characteristics of influenza cases consulting in Primary Care (PC) and severe influenza cases.